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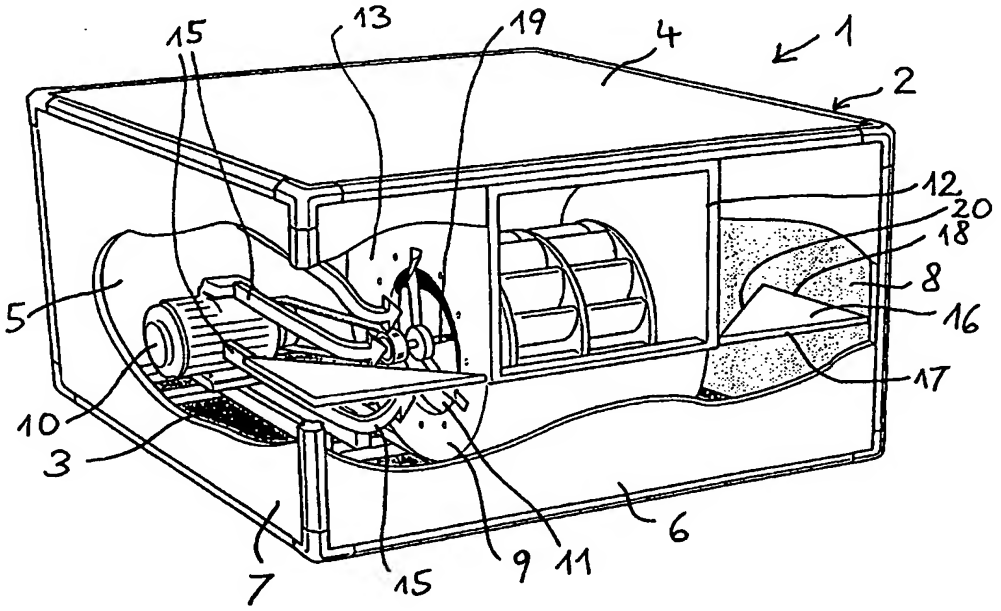

(57) Abstract

The present invention relates to an air treatment apparatus (1) having a house (2) housing a suction fan (9). The house (2) has walls (3–8). Air flows through the front wall (5), passes a lateral wall (7 and 8 respectively) and enters into the fan inlet (11) and leaves the house through an outlet (12) in the rear wall (6). With a view to prevent rotation of the air, which flows into the apparatus, guide means (16) are mounted in the space (13) in front of the fan inlet (11), which guide means (16) are made in the form of a triangular plate, the small sides (17, 18) of which extend to the rear wall (6) and one of the lateral walls (7) respectively and the hypotenuse of which (20) lies outside the greater portion of said space (13).

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AIR TREATMENT APPARATUS

The present invention relates to an air treatment apparatus of the type set forth in detail in the preamble of patent claim 1. When radial fans, particularly radial fans with double suction, suck air from a large space , i.e. when the fan inlet is not exposed to an adjacent wall or the like, certain performances are achieved , which in this context are called nominal performances. However, when assembling in an air treatment apparatus is carried out, the space from which the fan sucks air is limited , often quite limited, because an air treatment apparatus is not supposed to be wide open and/or bulky, need a lot of material when constructed etc. The performances of the fan then become impaired and these worse performances are called installation performances in this context. Thus, performance losses occur, which generally are believed to be due to the distance between the fan inlet and the adjacent apparatus walls. The losses will be the smaller the larger this distance is, which is quite understandable, since one comes closer to the "large" chamber, for which the nominal performances of the fan apply.

When the speed is e g 15 m/sec, calculated on the nominal inlet diameter, the following losses result.

Distance to wall/fan inlet diameter	Pascal
0.75	30,0
0.5	54,8
0.4	74,8
0.3	112
0.2	224

These losses have been accepted as a necessary evil and usually one selects a limitation downwards of the distance to the wall compared to the fan inlet diameter of 0.5.

US-A-3 523 743 and SE-B-430 092 relate to fans having the above-mentioned defects but being provided with guide rails.

According to the American specification the inlet side of the fan is not provided with a guide rail and thus, the cause of the rotation formation is not influenced in any way. A guide rail mounted on the outlet or pressure side of the impeller is designed to stabilize the air flow in the fan housing downstream the impeller.

According to the Swedish specification in a radial fan a rail guide is to a large extent mounted inside an impeller in order to bring about an alteration of the aerodynamics to make it match particularly well the requirements of an oil burner. By means of this most special design of a guide rail a mixing of different air flows and a large pressure increase across the fan for relatively small air flows is to be accomplished.

The object of the present invention is to minimize the above-mentioned losses and consequently achieve improved fan performances and to reduce the noise generation of the fan.

This object is attained according to the invention by designing an air treatment apparatus of the type set forth in the introduction mainly in such a way as is set forth in the characterizing clause of claim 1.

The inventor has discovered, that the phenomena, which result in the above-mentioned performance deterioration, are not only e g a general friction and turbulence, but a great part of the losses is caused by an exceptionally strong air rotation in front of or outside a fan inlet and this rotation is stronger the closer the inlet is positioned to an apparatus wall. Also, the inventor has discovered, that this rotation influences the functioning of the fan in a clearly negative manner, partly as regards the performances and partly as regards pulsations and noise.

In case the air rotation has the same direction as the fan, a pressure reduction is obtained. At the same time a output reduction then is obtained, which means, that a smaller efficiency reduction is obtained than what corresponds to the pressure reduction.

In case the air rotation has the opposite direction compared to the impeller rotation, no pressure reduction is obtained but an output increase and consequently an efficiency deterioration connected with it.

The rotation, irrespective of its direction, results in a pronounced noise increase in addition to the performance deterioration.

Thus, it is then quite obvious, that one should try to control the air rotations within this area and reduce them, e g by mounting in the interior of the fan guide rails or the like, which stop the rotation, which already has been caused upstream. However, we have then found, that a strong pressure difference is created across said guide rails or the like, which causes loss-impaired reliefs and results in a loss increase rather than a loss decrease. The guide rails or the like then also end up in a position, where the flow speed is the greatest.

As a consequence of the above-mentioned insights the inventor suggests, that at least a substantial air rotation caused in front of the fan inlet is counteracted and preferably is prevented as far-reaching as possible.

The inventor has found unexpectedly, when applying the above-mentioned insights, that guide means in more peripheral portions of the air space upstream the fan, namely actually outside the area, where more serious problems occur, result in evident improvements. In this area the speeds are low and a possible tendency to rotation formation can be stopped more easily without the occurrence of appreciable pressure differences across said guide means with resulting loss-causing reliefs. Finally, the inventor has unexpectedly found, that a relatively insignificant control, i.e. of a smaller portion of the air flowing into the apparatus, results in the best total effect with only minimal losses and other inconveniences. In case the flow of air into the fan is symmetrical in all directions, said guide means ought to be radially disposed in order not to prevent the flow of air into the fan. In the air treatment apparatus the air substantially flows in one direction and the guide means then substantially ought to be disposed in this direction in order to not prevent the flow of air into the fan. Tests have shown, that the guide means will have the greatest action, provided they are positioned in the air space opposite the side, from which the air flows.

The characterizing features of the invention are set forth in patent claim 1 but also in the subclaims.

By means of the characterizing features according to the invention the air rotation in front of a fan inlet is minimized and consequently the difference between the nominal performances of the fan and its installation performances is reduced in an inte-

resting way. On an average the losses are halved. Also, the conditions of flow measurement are improved by means of the devices, which are described in SE-B-500 539.

Thanks to experiments the inventor has developed guide means according to the invention in the form of a relatively simple guide plate, which in an unexpectedly efficient way prevents the undesired rotation and which consequently markedly improves the performances,the speed and the noise level of the fan.

The invention will now be explained more in detail, reference being made to the enclosed drawings, which show a preferred but not limiting embodiment and in which:

Fig 1 is a partially cut open perspective view from the outlet side and from above of a conventional air treatment apparatus, the air flow into one of the fan inlets being indicated by an arrow ;

Fig 2 shows the same apparatus in a perspective view from the inlet side and from above;

Fig 3 is a view, which corresponds to Fig 1, of an air treatment apparatus according to the invention;

Fig 4 is a view, which corresponds to Fig 2, of an air treatment apparatus according to the invention; and

Fig 5 is a diagram, which demonstrates the result of a comparison between three different tests.

In the drawings the same elements are indicated by the same reference numerals. Thus, an air treatment apparatus is indicated in its entirety by 1. It includes a house 2 having a bottom wall 3, a top wall 4, a front wall 5, a rear wall 6 and lateral walls 7 and 8. The apparatus houses a fan 9, which e g is a double-action fan and is driven by a motor 10. The fan has one inlet 11, or two inlets if it is a double-suction fan, and an outlet 12 in rear wall 6. The inlet hole or possibly the inlet holes in the house, e g in the front wall, can be shaped in various ways but is not shown for the sake of clarity. The space outside each fan inlet is indicated by 13 and the path of the air, which flows through this space, is illustrated by arrows 14 and 15 respectively.

As mentioned in the introduction above, the air which flows into space 13 rotates according to arrow 14 and results in the de-

scribed drawbacks.

In the apparatus according to the invention the air flows through space 13 in the form of substantially straight flow paths according to arrows 15, which paths merely adjacent the fan inlet are bent. This is possible thanks to guide means 16 according to the invention, preferably plane plates, which suitably have an at least mainly triangular shape, the small sides 17, 18 of the triangle contacting front wall 7 and matching lateral wall 8 respectively. The plate/plates is(are) positioned at least mainly in the same plane as fan shaft 19. In case the fan is attached directly to front wall 5, small side 18 suitably extends roughly up to the projected extension of the fan shaft, whereas small side 17 extends roughly all the way up to the plane, within which the respective fan inlet is positioned. Thus, hypotenuse 20 of the triangle is positioned outside the greater part of space 13, seen in the direction from the fan. Thus, space 13 substantially escapes the guide means and consequently is freely available for installation and repair work, possibly measurement and other additional equipment etc. It is of course easy to mount the guide plates in a quick and interchangeable way respectively and even in a deformable way, e g by mounting two or more plates in the form of a laminate, which plates on top of each other can be mutually displaced.

The guide plates of course do not have to have a triangular shape. They can have any shape and do not even have to be plane. They can have a transversal extension in relation to the plane, which goes through the fan shaft, particularly within the area for the respective inner corner in house 2, soft guiding zones being formed for the air streams along the apparatus walls. However, normally such special designs will not be required, since they do not result in more than marginal improvements. Guide plates having the shape shown in the drawings have proved to be unexpectedly efficient, which the diagram in Fig 5 also demonstrates. The unbroken line 21 represents an embodiment without lateral panels, namely without lateral walls 7 and 8, "the large room" thereby being symbolized. Line 22 with large dashes represents an embodiment having lateral walls and line 23 having small dashes represents an embodiment having lateral walls and guide means 16 according to the invention. As appears from the diagram the line with small dashes lies remarkably close to the unbroken line, which represents the ideal design.

The invention is not limited to the embodiments described above and shown in the drawings but can be modified and supplemented in an arbitrary way within the scope of the inventive idea as defined in the following patent claims.

CLAIMS

1. An air treatment apparatus (1), which includes a house (2) having a bottom wall (3), a top wall (4), a front wall (5), a rear wall (6) and lateral walls (7, 8) and housing an e g radial fan (9) with double-action having a horizontal fan shaft (19), guide means (16) being provided within the house (2) designed to influence the air, which flows into the fan, c h a r a c t e r i z e d in that said guide means (16) are mounted in an area, in which the air speeds are relatively low, namely in substantially peripheral portions of the air space upstream the fan (9), and each is a plane plate, mounted in the space (13) outside each fan inlet (11) and having an at least substantial extension in the same plane as the fan shaft (19), which guide means are designed and mounted to counteract and prevent respectively the rotation of the air flow (15), which flows into said space (13).

2. An air treatment apparatus according to claim 1, c h a r a c t e r i z e d in that said guide means (16) right against the adjacent house wall(s) (6; 8) and in the area of an inner corner respectively, formed by the same, have a certain smaller transversal extension in relation to the plane, which goes through the fan shaft (19) to form soft guide zones for air, which flows along said house walls into the apparatus.

3. An air treatment apparatus according to claim 2, c h a r a c t e r i z e d in that the plate at least substantially has a triangular shape, the small sides (17, 18) of which contact the front wall (5) of the house (2) and the matching lateral wall (7 and 8 respectively).

4. An air treatment apparatus according to claim 3, c h a r a c t e r i z e d in that one of the small sides (18) extends roughly up to the projected extension of the fan shaft (19) and/or in that the other small side (17) extends roughly up to the plane, in which the respective fan inlet (11) is situated.

5. An air treatment apparatus according to any of claims 1-4, c h a r a c t e r i z e d in that merely a small portion of the air, which flows into the fan inlet, is to be guided by said guide means (16), because said space (13) is unobstructed by said guide means, also as regards the plane, in which the guide means (16) are positioned.

6. An air treatment apparatus according to any of claims 1-5, c h a r a c t e r i z e d in that said guide means (16) are positioned in said space (13) on opposite side compared to the side, from which the air flows into the house (2) and the inlet or inlets (11) respectively.

7. An air treatment apparatus according to any of claims 1-6, c h a r a c t e r i z e d in that each guide plate (16) is designed and mounted respectively in such a way, that it is easy to mount it and replace it respectively and/or alter its shape, e g by using a plate, which comprises two or more parts, which in a laminate-like manner can be mutually displaced.

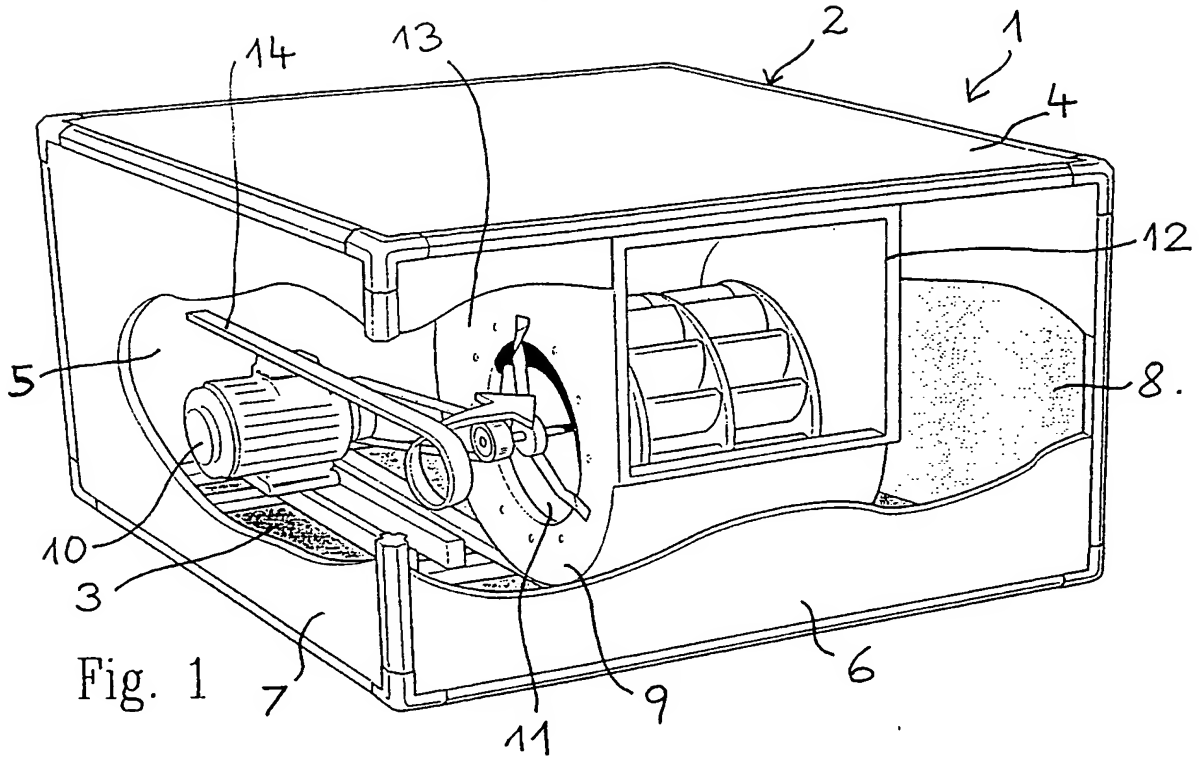
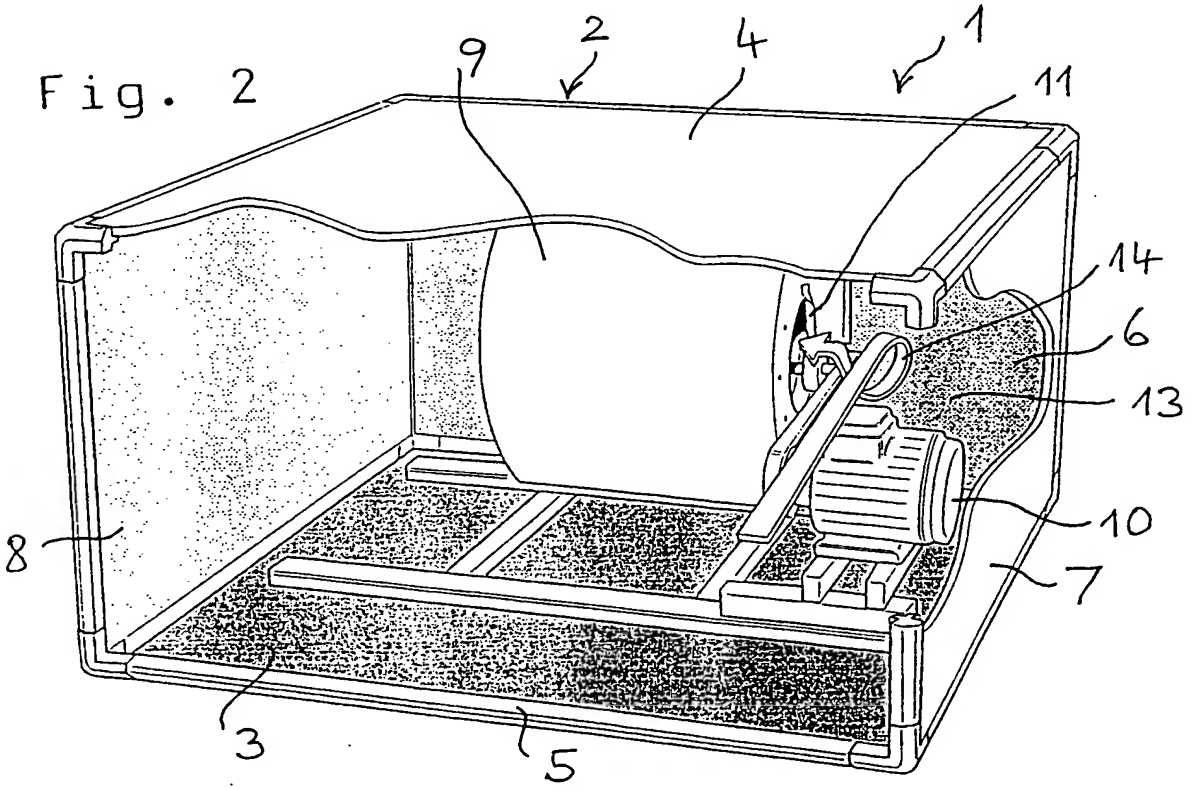


Fig. 1

Fig. 2



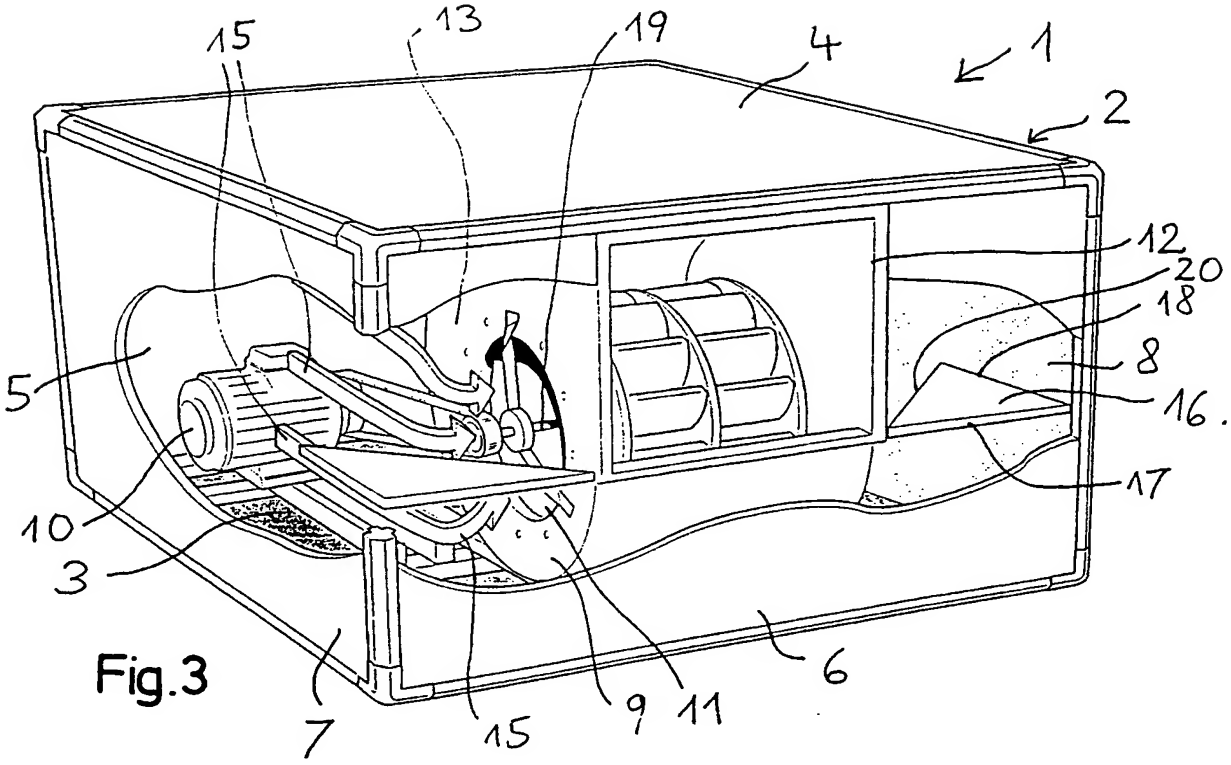


Fig.3

Fig. 4

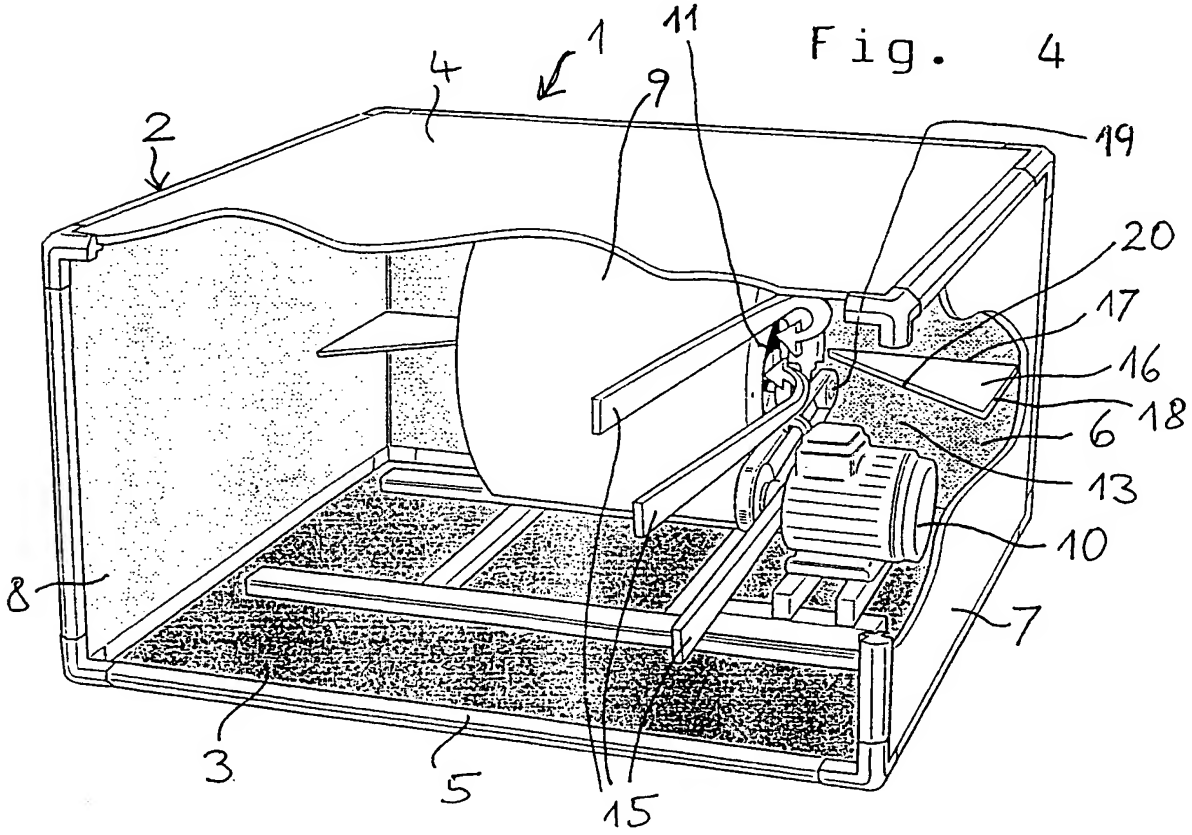
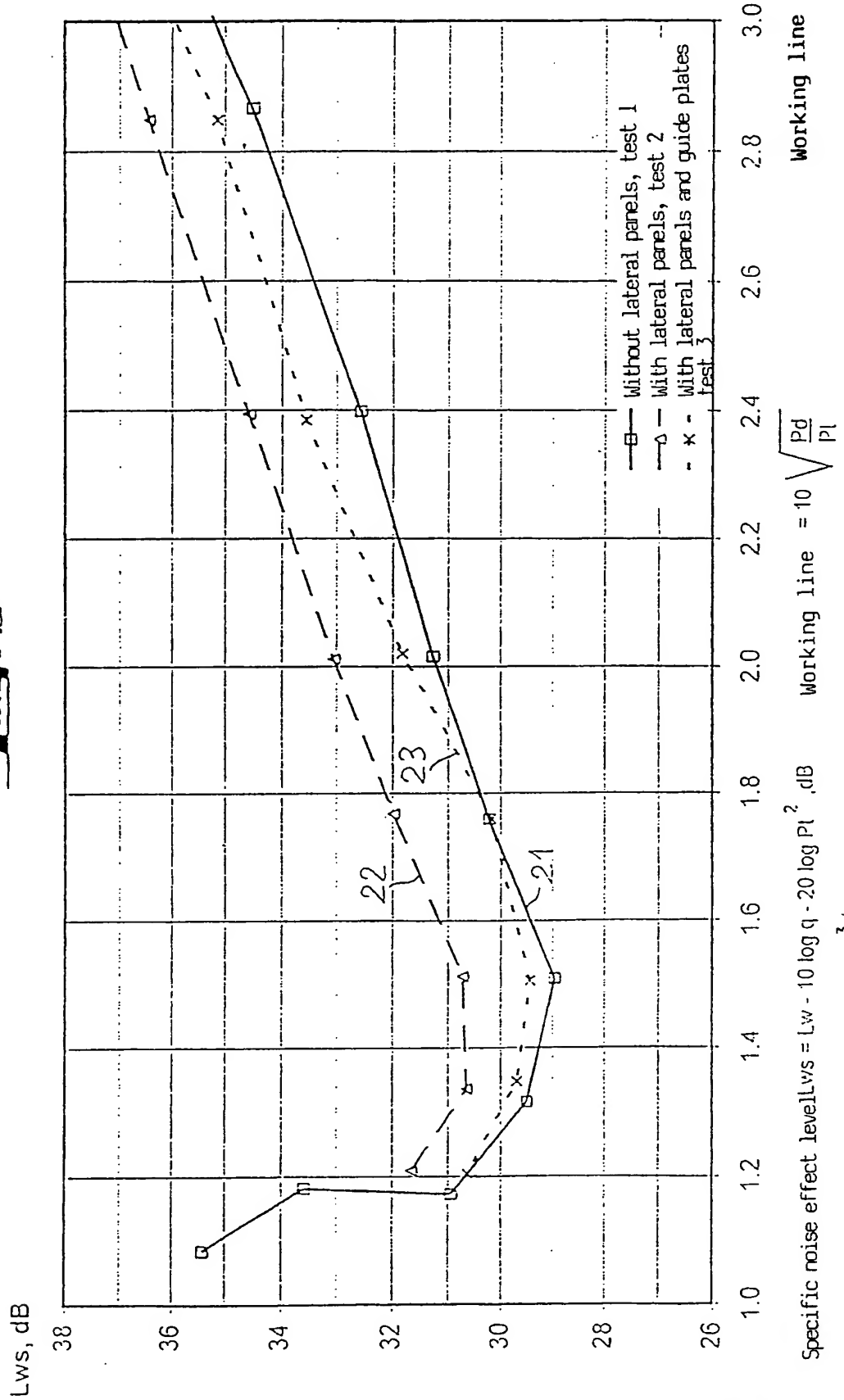


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F24F, F04D

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9116544 A1 (ABB FLÄKT AB), 31 October 1991 (31.10.91) --	
A	SE 430092 B (LENNART WALLMAN C/O FERGAS AB), 17 October 1983 (17.10.83) --	
A	US 3523743 A (G.P. JOLETTE), 11 August 1970 (11.08.70) -- --------	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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